that further prevent panel roll-out, or initiator region configurations utilized that optimize for resistance to such reversion displacement.

Objects Of The Invention

In view of the above, it is an object of one preferred embodiment of the present invention to provide a plastic container structure having a transversely oriented pressure panel in its lower portion that can provide for removal of vacuum pressure such that there is substantially no remaining force within the container.

It is a further object of one preferred embodiment of the present invention to provide a container which has a transversely oriented pressure panel that is decoupled to a degree from the adjoining wall such that greater inward and longitudinal movement can be achieved.

It is a further object of one preferred embodiment of the present invention to provide for a container to have a transversely oriented pressure panel that is inwardly displaced to a position above the standing ring of the final container configuration, such that a new base region is formed with a greater standing ring or foot print area, and the pressure panel is substantially protected from top load force applied to the container during commercial distribution.

It is a further object of one preferred embodiment of the present invention to provide for an improved transversely oriented pressure panel having an initiator portion which may utilize essentially the same angle as the control portion, such that greater removal of vacuum pressure can be obtained and such that greater resistance to outward deflection can also be obtained.

A further and alternative object of the present invention in all its embodiments, all the objects to be read disjunctively, is to at least provide the public with a useful choice.

Summary Of The Invention

According to one aspect of the present invention there is provided a container having a longitudinal axis, an upper portion having an opening into said container, a body portion extending from said upper portion to a lower portion, said lower portion including a base,

said base closing off an end of said container, said container having at least one substantially transversely oriented pressure panel portion located in said lower portion, said pressure panel portion being capable of folding from one longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container.

According to a further aspect of the present invention a container has a longitudinal axis and a base, and at least one substantially transversely oriented vacuum panel portion located adjacent to said base, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container following cooling of a liquid within the container after it has been capped, such that less force is exerted on the internal walls of said container.

According to a further aspect of the present invention a container has a longitudinal axis, a side wall and a base closing off one end, said container having a single substantially transversely oriented vacuum panel portion located within the base and joined to the side wall by a decoupling or hinge structure, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container.

Preferably in one embodiment the vacuum panel portion may include an initiator section and a control section, said initiator section providing for folding before said control section.

Preferably in one embodiment a decoupling structure connects the pressure panel portion with the body portion and is of an area which allows for greater inward and upward longitudinal movement of the pressure panel.

Preferably in one embodiment the vacuum panel portion has no strengthening ribs to restrain substantial longitundinal movement and inversion.

Preferably in one embodiment the vacuum panel portion may include fluting structures or the like to allow an even circumferential distribution of folding forces to provide for increased control over folding the panel portion from one inclined position to another and to assist in preventing unwanted return to the original position.

Preferably in one embodiment after folding, the container standing support is provided by a lower part of the container sidewall that provides a replacement container standing support.

According to a further aspect of the invention a method of compensating for a change in pressure in a container as defined in any one of the preceding eight paragraphs is provided in which said method includes applying a force to the or each said panel portion to cause said folding to occur.

According to a further aspect of this invention there is provided a hot-fill container substantially as herein described with reference to any one of the embodiments of the accompanying drawings.

Further aspects of the invention which should be considered in all its novel aspects will become apparent from the following description.

Brief Description of Drawings

Figure 1: shows a cross-sectional view of a hot-fill container according to one possible embodiment of the invention in its pre-collapsed condition;

Figure 2: shows the container of Figure 1 in its collapsed position;

Figure 3: shows the base of Figure 1 before collapsing;

Figure 4: shows the base of Figure 2 following collapsing;

Figure 5: shows an underneath view of the base of the container of Figure 1 before collapsing.

Figure 6: shows the base of Figure 1 before collapsing;

Figure 7: shows the base of Figure 2 following collapsing;

Figure 8a: shows a cross-sectional view of a hot-fill container according to an

CLAIMS:

1. A container having a longitudinal axis, an upper portion having an opening into said container, a body portion extending from said upper portion to a lower portion, said lower portion including a base, said base closing off an end of said container, said container having at least one substantially transversely oriented pressure panel portion located in said lower portion, said pressure panel portion being capable of folding from one longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container.

2. A container as claimed in claim 1 wherein said pressure panel portion is adapted to resist being expanded from the inverted position.

3. A container as claimed in claim 1 wherein said pressure panel portion includes an initiator portion and a control portion, said initiator portion providing for folding before said control portion.

4. A container as claimed in claim 3 wherein said control portion has a more acute angle than the initiator portion relative to the longitudinal axis of the container and wherein the initiator portion causes said control portion to invert and flex further inwardly into the container.

5. A container as claimed in claim 1 wherein said pressure panel portion provides compensation of vacuum pressure induced, in use, within the container following cooling of a heated liquid within the container after it has been capped, such that there remains substantially no vacuum pressure inside the container.

6. A container as claimed in claim 5 wherein said pressure panel portion is adapted in use to invert longitudinally under an externally applied mechanical force.

7. A container as claimed in claim 1 wherein said pressure panel portion is located immediately adjacent said base.

8. A container as claimed in claim 1 wherein said pressure panel portion is of variable width and inverts from its widest portion to its narrowest portion.

9. A container as claimed in claim 3 wherein said initiator section has an angular inclination relative to said longitudinal axis which is substantially the same as that of the control section.

10. A container as claimed in claim 1 wherein said pressure panel portion is adapted to cause said base to retract longitudinally into said body portion.

11. A container as claimed in claim 10 wherein said pressure panel portion is adapted to cause said lower portion of said body portion to replace said base portion in providing a standing support for the container.

12. A container as claimed in claim 11 wherein its structure is such that in use a top load applied to the container is transferred from said base to a portion of a sidewall of the container.

13. A container as claimed in claim 1 wherein said pressure panel portion is connected with said lower portion by a decoupling or hinge structure.

14. A container as claimed in claim 1 wherein said pressure panel portion includes outwardly projecting portions.

15. A container as claimed in claim 1 wherein said pressure panel portion includes inwardly projecting portions.

16. A container as claimed in claim 1 wherein said pressure panel portion is adapted in use to remove vacuum induced, in use, in the container such that substantially no vacuum remains.

17. A container as claimed in claim 3 wherein said control portion is outwardly inclined at an angle of more than 10° relative to a plane orthogonal to said longitudinal axis.

18. A container as claimed in claim 17 wherein said angle is between 30° and 45° and the angle of the initiator portion is at least 10° less.

19. A container as claimed in claim 1 wherein said pressure panel portion is included in said base.

20. A container as claimed in claim 1 having a single said transversely oriented pressure panel portion located in said lower portion.

21. A container as claimed in claim 1 wherein said pressure panel portion is adapted in use to provide compensation for internal pressure induced within the container following heating of a liquid within said container after it has been capped.

22. A container as claimed in claim 21 wherein said pressure panel portion is adapted in use to subsequently provide compensation for reduced pressure induced within the container following cooling of said liquid within the capped container, such that less force is exerted on the internal walls of said container.

23. A container having a longitudinal axis, walls and a base, said container having at least one substantially transversely oriented vacuum panel portion located adjacent to said base, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container following cooling of a liquid within the container after it has been capped, such that less force is exerted on the walls of said container.

24. A container having a longitudinal axis, a side wall and a base closing off one end, said container having a single substantially transversely oriented vacuum panel portion located within the base and joined to the side wall by a decoupling or hinge structure, said vacuum panel portion being adapted in use to fold from a longitudinally inclined position to an inverted position to compensate for a change of pressure induced within the container.

25. A container as claimed in Claim 1 in which the pressure panel portion includes a plurality of flutes forming a conical area in the base.

26. A container as claimed in claim 25 in which alternate flutes are inclined at a greater or lesser angle relative to the longitudinal axis.

27. A container as claimed in claim 25 in which the flutes are outwardly convex.

28. A container as claimed in claim 25 in which the flutes are inwardly concave.

29. A container as claimed in Claim 1 in which after folding of the panel portion an end tip of the base portion is adapted to be displaced upwardly such that a new base region is formed that includes the pressure panel portion such that a greater standing ring or footprint area is provided.

30. A container as claimed in Claim 1 and including a decoupling structure connecting the pressure panel portion with said body portion and is of an area which allows for greater inward and upward longitudinal movement of the pressure panel.

31. A container as claimed in Claim 1 whereby the pressure panel has no strengthening ribs to restrain substantial longitudinal movement and inversion.

32. A method of compensating for a change in pressure induced within a container according to claim 1 in which said method includes applying a force to the or each said pressure panel portion to cause said folding to occur.

33. A force applying means for performing the method of claim 32.